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REMARKS

Pending Claims

Claim 20 has been amended to clarify dependency. No new matter has been added. Claims 2-5 were cancelled in a previous amendment. Thus, claims 1 and 6-25 are pending.

Summary of the Invention

The present invention relates to a process for preparing organically modified, permanently hydrophobic aerogels.

Claim Objection

In paragraph 3 of the Office Action, the Examiner has objected to claim 20, indicating that the phrase "claim 4 1" appears to contain a typographical error and that "4" should be deleted since the claim was cancelled. Applicants note that the "strikethrough" text used to delete the "4" in the previous response did not show up clearly on the printed copy submitted to the Patent Office. Therefore, claim 4 has been resubmitted as "currently amended" in order to more clearly show the deletion of "4" from claim 20. Applicants therefore respectfully request that this objection be withdrawn.

Rejection of Claims under 35 U.S.C. § 103(a)

The Examiner has rejected the claims 1, 6-18, 20-22, and 24 as being unpatentable over Lentz (U.S. Patent No. 3,122,520) in view of WO 96/06809. Applicant respectfully disagrees.

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In paragraph 5 of the Office Action, the Examiner states that Lentz teaches a process comprising the steps of converting the hydrogel to an organogel, and mixing hydrogel/organogel with an organosilicon compound to perform the hydrophobing reaction. The Examiner further states that the step of converting the hydrogel to an organogel may occur prior to, simultaneous with, or subsequent to the step of mixing with the organosilicon compound. The Examiner also states that Lentz teaches a small group of organosilicon compounds, which includes hexaethyldisiloxane. The Examiner therefore concludes that Lentz teaches performing its process of first washing the lyogel with an organic solvent to replace the water with organic solvent, followed by a step of hydrophobing using one its preferred organosilicon compounds, which includes hexaethyldisiloxane.

The Examiner further concludes that the organogel of Lentz would inherently be free of water since Lentz teaches that the water is "removed" and the organic solvent "replaces" the water.

The Examiner notes that Lentz lacks a teaching of preparing a silicate-type hydrogel by bringing an aqueous water glass solution to a pH value ≤ 3 with the aid of an acidic ion-exchanged resin or an inorganic acid to produce silicic acid and polycondensing the silicic acid via a base to give a silicate gel. However, the Examiner states that, since Lentz does teach that any silica hydrosol can be employed, one of ordinary skill in the art would have been motivated to look to the prior art for conventional methods for forming silicate-type hydrogels. Since WO 96/06809 disclosed the claimed method for making a silicate hydrogel, the Examiner concludes that it would have been obvious to one having ordinary skill in the art to have used a silica sol made by the method of WO 96/06809 in the processing method of Lentz since Lentz specifically states that the starting material of silica hydrosol of its invention may be made by any method (and even mentions an exemplary method of deionizing sodium silicate using ion exchange resin) and WO 96/06809 discloses an exemplary method of making silica hydrosol for use in a method similar to that of Lentz.

The claims of the present invention and the disclosure of Lentz describe very different methods of forming a gel. In particular, claim 1 of the present invention recites, in part, a process

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in which a lyogel is prepared by polycondensing silicic acid via the addition of a base to give a SiO_2 gel (see step a) of claim 1). Thus, the gel-forming step of the present invention involves the addition of base.

By comparison, in the method of Lentz, a gel forming step that involves the addition of acid is described. This is the first step of the method of Lentz. As described in this reference, a silica hydrosol is provided, and the hydrosol is heated under strong acid conditions at a pH of "not greater than 1" (see column 1, line 51). This "acid heating step" is clearly the gel-forming step of the method of Lentz, which is why Lentz states that the second step involves mixing "this hydrogel" with the defined organosilicon compounds (see column 2, lines 7-11). Also, Example 10 shows that, as the first step, a hydrosol is mixed with enough sulfuric acid to bring the pH to below 1, and the sol is then heated at 100°C "until the surface area of the resulting hydrogel" is as defined "when the hydrogel is thereafter washed" (see column 7, lines 22-32). Furthermore, claim 1 clearly describes a two step method in which step 1) involves the heating a specified acid silica hydrosol with acid at a pH below 1, and then "the hydrogel produced in 1)" is mixed with an organosilicon compound.

Therefore, it is clear that the first step of the method of Lentz is a method of forming a gel which involve the use of very acidic conditions. This is not the method of the present invention, which, as recited in present claim 1, involves the addition of base, not acid.

In order to cure the deficiencies of Lentz, the Examiner refers to WO 96/06809 as disclosing a method of preparing a hydrosol and concludes that, since Lentz states that any hydrosol may be used, using the method of WO 96/08609 as the method for preparing the hydrosol in Lentz would result in the method of the present invention. However, Applicant believes that the Examiner has incorrectly used WO 96/06809 as showing a method of making a silica hydrosol. This reference describes a method in which the pH of an aqueous water glass solution is adjusted to ≤ 3 with the aid of an acidic ion-exchanged resin or mineral acid, adding base to the resulting silicic acid, adding fibers, and allowing the silicic acid to polycondense to

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form a gel. Therefore, this is not a method of making a silica sol, as stated by the Examiner, but rather is a method a making a gel.

WO 96/06809 describes a very different method of preparing a gel than that described in Lentz, and Applicant therefore believes that these references cannot be combined. Combining the references would mean that the gelling step of Lentz would have to be replaced with the gelling step of WO 96/06809. However, Lentz clearly states that the acid heating step – the gel-forming step of Lentz – is an essential element of the invention. For example, Lentz teaches that “[f]or the purposes of the present invention it is essential that the sol be heated at a temperature of from 50 to 250°C. with sufficient strong mineral acid so that the pH of the sol during heating is one or less.” (see column 2, lines 35-38). In addition, Lentz identifies the novelty of the method as “the combination of the first step with the second step to produce improved fillers” (see column 2, lines 5-14). Thus, Lentz teaches a process in which an “essential” gel-forming step is combined with a second hydrophobing step. One skilled in the art would not go against the expressed teaching of Lentz and use a different gel-forming step. Therefore, these references cannot be combined.

Ever if they were combined, Applicant believes that the combination would not result in the method of the present invention. Any combination of Lentz must include the acid heating step of a hydrosol to produce a hydrogel, and this is not the gelling step of the present invention (step a) of claim 1).

Therefore, Applicant believes that claim 1 is patentable over Lentz in view of WO 96/06809. Furthermore, claims 6-18, 20-22, and 24, which depend directly or indirectly from claim 1, recite further embodiments of the present invention and, for at least the reasons discussed above, are also patentable over these reference. Applicant therefore believes that claims 1, 6-18, 20-22, and 24 are patentable over Lentz in view of WO 96/06809 and respectfully requests that this rejection be withdrawn.

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Conclusion

In view of the foregoing remarks, Applicant believes that this application is considered to be in good and proper form for allowance, and the Examiner is respectfully requested to pass this application to issue. If, in the opinion of the Examiner, a telephone conference would further expedite the prosecution of the subject application, the Examiner is invited to call the undersigned.

Respectfully submitted,



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HOEK314-US response

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